REMARKS

Claims 1, 3-9, 11-15, and 18-20 are pending in this application and stand rejected under 35 USC 103(a) over Kaplan (US 6,819,008) in view of Rozman (US 6,084,786). Applicants traverse these rejections for the following reasons.

Claim 1 is directed to a method of compensating for differences between an applied DC link voltage and a predetermined DC link voltage in an electrical machine. The electrical machine comprises a rotor, at least one phase winding, and a controller. The controller comprises a memory storing a voltage compensation map comprising a plurality of correction factors. The method includes measuring the applied DC link voltage, obtaining a correction factor by addressing the voltage compensation map using the applied DC link voltage, and applying the obtained correction factor to the angular position of energization of the phase winding.

The cited art does not disclose or suggest a controller comprising a memory storing a voltage compensation map comprising a plurality of correction factors, as claimed. On pages 4-5 of the Action, the Examiner asserts that Kaplan's mapping graphs illustrated by Figs. 5 and 6 suggest a memory storing a voltage compensation map comprising a plurality of correction factors. This is incorrect. Kaplan's maps illustrate the various turn-on and conduction angles that achieve the same output power for a particular speed of the generator. From this group of angles, a single pair of turn-on and conduction angles is selected that results in the smallest phase current. The single pair of turn-on and conduction angles is then stored to the control map for that particular speed. See Kaplan, col. 7, line 59 – col. 8, line 6. Kaplan's maps thus store turn-on and conduction angles rather than a voltage compensation map comprising a plurality of correction factors, as claimed. Rozman does not remedy this deficiency of Kaplan.

Furthermore, the cited art does not disclose or suggest obtaining a correction factor by addressing the voltage compensation map using the applied DC link voltage, as claimed.

Rather, Kaplan's correction factor is calculated on-the-fly according to the magnitude of the difference in the actual and desired output power (e.g. Kaplan, col. 8, lines 31-50 and col. 9, lines 15-18). Accordingly, Kaplan's correction factor is not obtained by addressing a voltage compensation map, as claimed. Rozman does not remedy this deficiency of Kaplan.

In addition, the cited art does not disclose or suggest measuring the applied DC link voltage and obtaining a correction factor by addressing a voltage compensation map using the applied DC link voltage. Kaplan only discusses measuring the output power generated by the generator so that the actual output power can be compared with a desired output power for determining whether to adjust the conduction angle. On page 4 of the Office Action, the Examiner asserts that it would have been obvious to one of ordinary skill in the art to modify Kaplan's DC link current feedback with the DC link voltage feedback as taught by Rozman. Applicants respectfully submit that one of ordinary skill in the art would not make such a modification.

Rozman describes an AC-to-DC converter that controls the amount of power drawn by a load in order to obtain a power factor as close as possible to unity. The circuitry responsible for this is often referred to as an active power factor correction (PFC) circuit. The apparent power drawn from an AC supply is the sum of the real power and the reactive power. The real power is that power consumed by the resistive part of the load (i.e. the power that actually goes into doing work). Reactive power, on the other hand, is that power stored by the reactive part of the load, which is subsequently returned to the AC supply. Although the reactive power stored by the load is returned to the AC supply (i.e. there is no net flow of energy), the constant sloshing back and forth of reactive power increases the level of current through the system, thereby resulting in greater losses.

The AC-to-DC converter described by Rozman controls the amount of current drawn by the load 68 such that very little reactive power is drawn from the AC supply 54. This is achieved through the use of a current regulator 90 and a current transformer 100, 102, 104 for

each phase of the AC supply (in the example provided by Rozman, the AC supply has three phases). Each current transformer provides the current regulator with a measure of the current for the respective phase of the AC supply. The current regulator also measures the voltage of each phase of the AC supply at junctions 52, 58, 62. The current regulator then controls the rectifier switches 20, 22, 24, 26, 28, 30 so that the current waveform drawn from each phase of the AC supply matches that of the voltage waveform (e.g. Rozman, col. 4, lines 29-35). No reactive power is consumed and a power factor of unity is achieved when the waveforms of the AC current and the AC voltage are in phase.

Quite separately from achieving a high power factor, the AC-to-DC converter also attempts to reduce the ripple on the output DC voltage. This is achieved by means of a comparator 80 that compares the voltage across the link capacitor 66 (and thus across the load 68) with a reference voltage. In the absence of any ripple, the voltage across the capacitor, V_{DCFDBK}, is the same as that of the reference voltage, V_{DCREF}. However, any ripple will result in an error being output by the comparator, which is then delivered to the current regulator 90. The current regulator in turn controls the rectifier switches so as to minimise the ripple (e.g. Rozman, col. 4, lines 47-53). Thus, Rozman describes an AC-to-DC converter that comprises a current regulator that controls the switches of the rectifier so that (i) a power factor of unity is achieved and (ii) ripple in the DC voltage is minimized.

Turning to the arguments put forward by the examiner, the examiner states that *'Rozman discloses a converter system with power factor and DC ripple control comprising a DC link voltage feedback <u>used for correcting the power factor to control the DC ripple of the system</u>'* (emphasis added). The power factor and DC voltage ripple are two very different things. It is incorrect to suggest that the power factor is corrected to control the ripple in the DC voltage. The power factor is effectively a measure of the phase difference between the AC current and the AC voltage. In contrast, the ripple is on the DC voltage that is output by

the AC-to-DC converter. Furthermore, the DC link voltage feedback is used to control the ripple in the DC voltage only; it is not used to control the power factor.

The examiner goes on to state that *'Knowing the use of DC link voltage to convert into power factor determination ... would produce the same result of detecting the DC link feedback to control the power factor of the system.'* Applicants are confused as to what the Examiner means by this statement. In particular, the DC link voltage does not provide a measure of the power factor. It is the phase relationship between the AC current and the AC voltage that provides a measure of the power factor.

Finally, the examiner states *'Since Rozman uses a DC link voltage feedback to control the power factor and DC ripple control, it would have been obvious to one of ordinary skill in the art to modify Kaplan et al's DC link current feedback with he DC link voltage feedback as taught or suggested by Rozman.'* First, as already noted, the DC link voltage feedback of Rozman is not used to control the power factor but is instead used only to control the DC ripple (e.g. Rozman, col. 4, lines 29-36 and 47-53). Second, the skilled person would have had no reason to substitute the DC current feedback of Kaplan with the DC link voltage feedback of Rozman and, in fact, would have been discouraged from making such a substitution.

As discussed in MPEP 2143.01.IV, "'rejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" *KSR*, 550 U.S. at ___, 82 USPQ2d at 1396 quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). As discussed above, the generator of Kaplan corrects the conduction angle in response to changes in the output power and not the DC link current. Thus, it is unclear why one of ordinary skill in the art would replace Kaplan's DC link current feedback with Rozman's DC link voltage feedback. Applicants submit that the Examiner has not provided a credible reason for the combination and thus has not presented a prima facie case of

obviousness. See MPEP 2142. In addition, the proposed modification would render Kaplan unsatisfactory for its purpose and change its principle of operation. See MPEP 2143.01.V and VI. Again, as discussed previously, the generator of Kaplan includes a feedback loop that measures the actual output power generated by the generator. If the actual output power differs from the desired output power, the generator adjusts the conduction angle. The skilled person would thus recognise that one of the key benefits of the generator of Kaplan is that it maintains a desired output power. This can be important in ensuring that the generator satisfies a stated rating, for example. In order to maintain a desired output power, it is necessary that Kaplan's generator measures the output power. Accordingly, the skilled person would not have modified Kaplan such that the output power is not monitored.

In view of the foregoing, claim 1 is allowable. The other claims are allowable for similar reasons. Applicants request that the Examiner withdraw the outstanding rejections and issue a Notice of Allowance.

In the event that the transmittal letter is separated from this document and the Patent and Trademark Office determines that an extension and/or other relief is required, applicants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing Docket No. **424662013400**.

Respectfully submitted,

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